PATENT CLAIMS

1. Device for detecting thermal conductivity of a sample by application of optical pulse techniques, comprising
a furnace for heating the sample to a predetermined temperature,
a source of radiation for emitting high-energy radiation in the form of pulses onto said sample for heating the sample,
an infrared sensor for detecting time history of infrared radiation emitted by said sample,
a decoupler element for decoupling a reference radiation from a beam emitted by said source of radiation,
a second sensor for measuring said reference radiation, as well as
an analyzer unit for detecting the thermal conductivity of the sample by analyzing signals of said infrared sensor,
said second sensor for measuring said reference radiation having a bandwidth that is substantially wider than a reciprocal value of pulse length of said source of radiation,
said analyzer unit being so designed that it detects the thermal conductivity by deriving it from the signals of said infrared sensor, which are corrected by performing a convolution with the measuring signals of said second sensor by approximating a laser pulse by sections in at least two sections by means of exponential functions, and
said analyzer unit being designed for detecting a time difference between a rated zero point in time and a starting point of approximated optical pulse.

2. Device according to Claim 1,
characterized in that

said analyzer unit is designed for approximating a high-speed rising edge of the laser pulse by the formula

$$I_1(t) = A \cdot \left[1 - \exp\{-(t - Delay)/\tau_1\}\right]$$

3. Device according to Claim 1,
characterized in that
said analyzer unit is designed for approximating a high-speed rising edge of the laser pulse by the formula

$$I_1(t) = A \cdot \left[1 - \frac{\tau_{12}}{\tau_{12} - \tau_{11}} \cdot \exp\{-(t - Delay)/\tau_{12}\} + \frac{\tau_{11}}{\tau_{12} - \tau_{11}} \cdot \exp\{-(t - Delay)/\tau_{11}\}\right]$$

4. Device according to Claim 1,
characterized in that
said analyzer unit is designed for approximating a high-speed rising edge of the laser pulse by the formula

$$I_2(t) = I_1(t) \cdot \exp\{-(t - Delay)/\tau_2\}$$

5. Device according to Claim 1,
characterized in that
said analyzer unit is designed for approximating a high-speed downward ramp of laser radiation after cut-off of pumping light, by the formula

$$I_3(t) = I_2(t = Delay + t_e) \cdot \exp\{-(t - Delay - t_e)/\tau_3\}$$

6. Device according to Claim 1,
characterized in that
said analyzer unit is designed for approximating a high-speed downward ramp of laser radiation after cut-off of pumping light, by the formula

$$I_3(t) = I_2(t = Delay + t_e) \cdot \left[\frac{\tau_{32}}{\tau_{32} - \tau_{31}} \cdot \exp\{-(t - Delay - t_e)/\tau_{32}\} - \frac{\tau_{31}}{\tau_{32} - \tau_{31}} \cdot \exp\{-(t - Delay - t_e))/\tau_{31}\} \right]$$

7. Device according to Claim 1,
characterized in that
said analyzer unit is so designed that it takes approximations of an optical pulse as a basis for performing a convolution with model functions for heat transfer.

8. Device according to Claim 1,
characterized in that
said analyzer unit is designed for performing a convolution of an optical pulse by means of a model function for heat transfer with application of a Cowan approximation.

9. Device according to Claim 1,
characterized in that
said analyzer unit is designed for performing a convolution of an optical pulse by means of a model function for heat transfer for translucent materials.

10. Device according to Claim 1,
characterized in that
said analyzer unit is designed for performing a convolution of an optical pulse by means of a model function for heat transfer with application of a Cape-Lehmann solution.

11. Device according to Claim 1,
characteriz d in that
said analyzer unit is designed for performing a convolution of an

optical pulse by means of a model function for heat transfer in multiple layers, preferably double or triple layers.

12. Device according to Claim 1,
characterized in that
said analyzer unit is designed for performing a convolution of an optical pulse by means of a model function for heat transfer for multiple layers having thermal resistance.

13. Device according to Claim 1,
characterized in that
said analyzer unit is designed for performing a convolution operation by way of subtraction of spectrally transformed measured values and subsequent re-transformation.